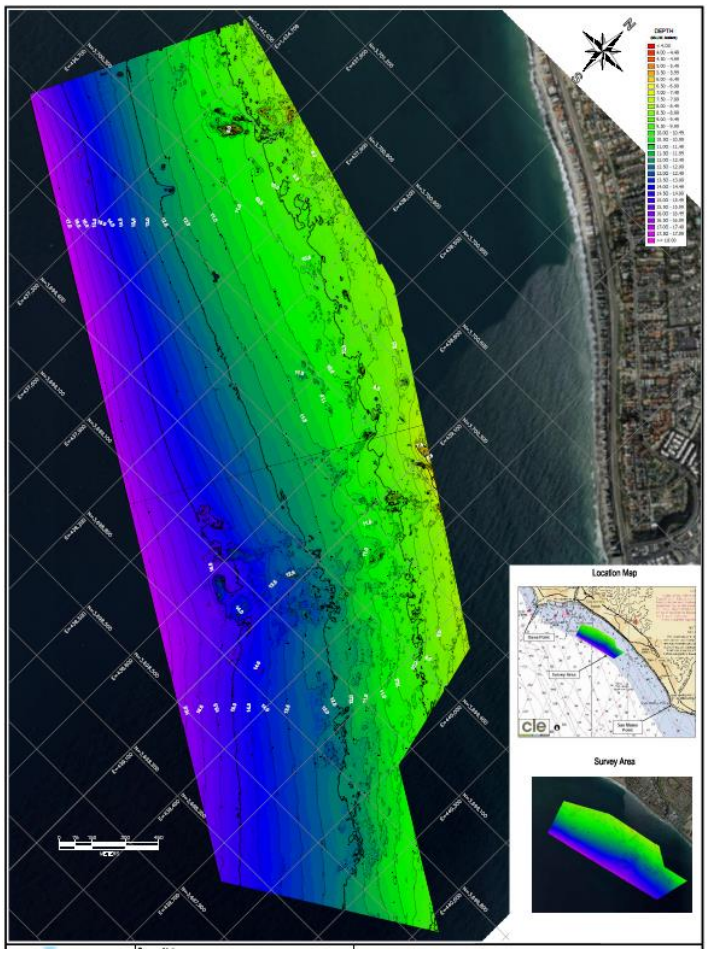
GEOPHYSICAL SURVEY OFFSHORE OF SAN CLEMENTE AT WHEELER NORTH REEF



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CE Reference No. 17-09
6 June 2017

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GEOPHYSICAL SURVEY OFFSHORE OF SAN CLEMENTE AT WHEELER NORTH REEF

Field Operations Report

1.0 INTRODUCTION

Ecosystems Management Inc. (ECOM) conducted two geophysical surveys, a sub-bottom profile survey on April 21st and a multibeam sonar survey April 17th through the 22nd in order to determine the extent and thickness of unconsolidated sands overlying the latest Quaternary sandy conglomerates of San Juan Creek. The purpose of the survey was to understand prospective locations for emplacement of kelp reef restoration at Wheeler North Reef (WNR). The equipment used included a DGNSS positioning and attitude system, a Kongsberg EM3002 dual multibeam sonar, and the acoustic source consisted of a Teledyne Benthos VT170 sub-bottom profiler. The survey was conducted from just beyond the surf zone to about 1800 m offshore and approximately 4000m alongshore.

1.1 PERMITTING: CA STATE LANDS COMMISSION

Prior to the geophysical survey work, CE acquired the necessary permit from the California State Lands Commission (Permit # PRC 8536.9). As per permit requirements, a Marine Wildlife Contingency Plan was prepared and a marine wildlife monitor was present during the surveys to assure that marine mammals were not harmed by the acoustically generated pulses produced by the bathymetric survey equipment. Mammal observations that were carried out during the surveys determined when survey activities should be altered or stopped to avoid interaction with marine mammals. A copy of the Marine Wildlife Monitoring Report recorded during the survey and test patch is in Appendix A. Additionally, all parties identified in Exhibit C of the permit were sent notification of the geophysical survey activity. Figure 1-1 shows the survey area.

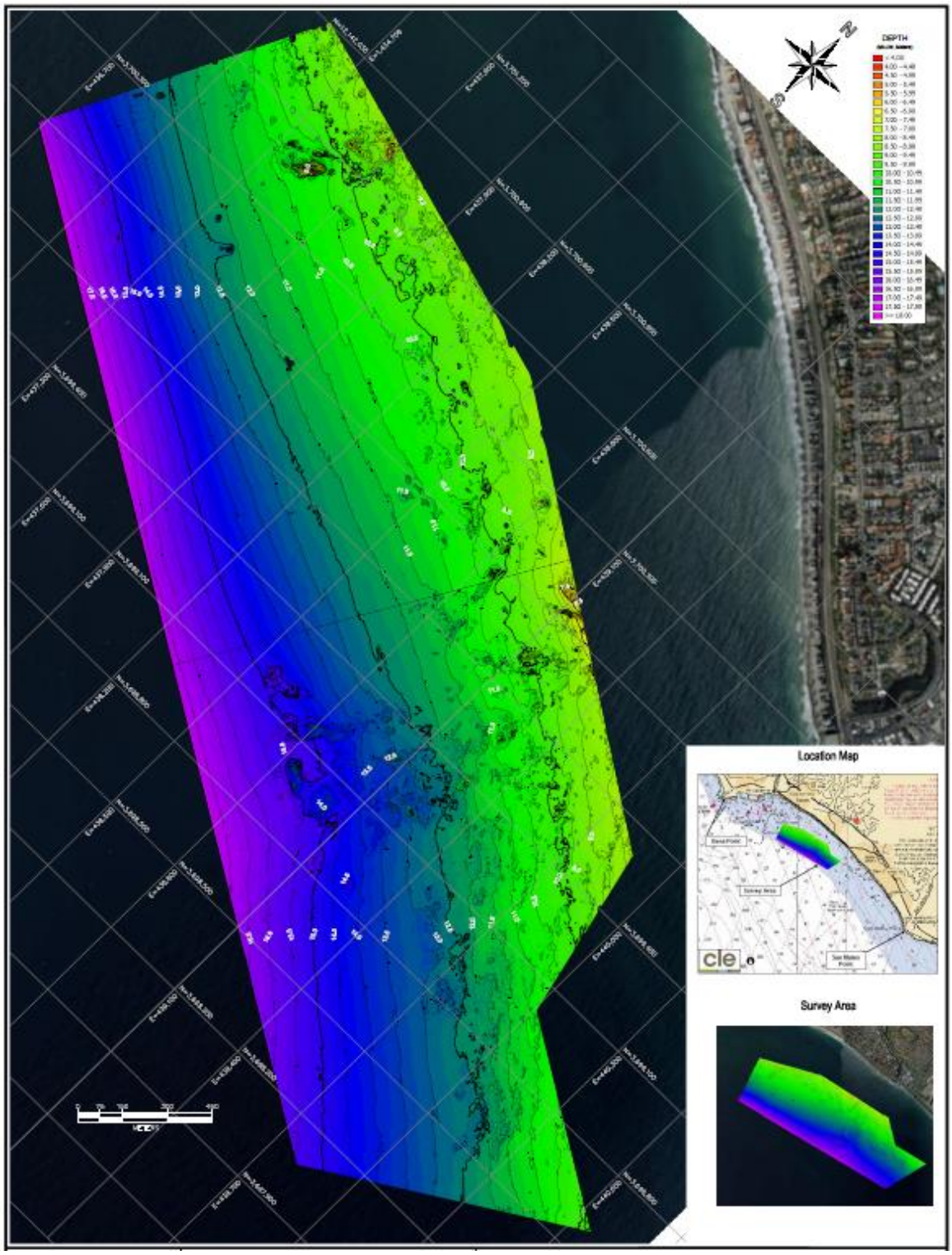

Figure 1-1. Prospective image of the survey area at Wheeler North Reef offshore San Clemente, California.

2.0 SURVEY METHODS AND INSTRUMENTATION

2.1 GEOPHYSICAL SURVEY DATE

The sub-bottom profile survey was conducted on April 21st, 2017 and the multibeam sonar survey was conducted April 17th through the 22nd. The purpose of the surveys was to provide data to assess the suitability and locations for the expansion of the WNR restoration reef site.

2.2 SURVEY VESSEL

The R/V *Molly*, was used as the survey vessel for the project (Figure 2-1). The vessel was equipped with the following primary equipment for execution of the surveys:

1. Teledyne Benthos VT170 sub-bottom profiler
2. Kongsberg EM3002 dual multibeam sonar
3. DGNSS Positioning and attitude system
4. A Chesapeake Technologies sonar Wiz

2.3 DATA ACQUISITION AND INSTRUMENTATION

2.3.1 GPS Positioning

A C-Nav 3050 Differential Global Navigation Satellite System (DGNSS) Precise Point Positioning system provided high accuracy position data during the survey. The GPS health was monitored continuously via the C-NaviGatorII. Position data was output to all sensor acquisition systems and raw data logged directly from the receiver.

Hypack navigation software provided real-time vessel positioning using DGNSS and inertial navigation inputs. The navigation software provided paged output to the helmsman for survey vessel tracking (Table 2-1 and Figure 2-1). The system collected, displayed and logged various DGNSS quality information and additional online quality assessment information.

2.3.2 Sub-bottom Profiler

A Teledyne Benthos TTV-170 sub-bottom profiler was used and sweeps from 2-20 kHz were used to retrieve acoustic returns from the sub-sand horizon at a repetition rate of 10 Hz. RTK-GPS position corrections were supplied by the Leica Geosystems Smartnet VRN supplied to the vessel survey sytems via an Intuicom RTK Bridge.

Data were collected relative to Geoid 12a (NAVD88 vertical datum), and converted to MLLW utilizing +0.05 Meter offset.

2.3.3 Multibeam Echo-sounder System (MBES)

A Kongsberg EM3002, 300 kHz high-resolution multibeam echosounder was used for acquisition of bathymetric and backscatter data. The system was hard mounted on the port side of the survey vessel using an Oceaneering portable mounting bracket.

Data acquired with the EM3002 were recorded and monitored in real time with the Simrad Seafloor Information System (SIS) for the duration of survey operations. SIS displayed a variety of real-time imagery so that sonar settings could be adjusted to improve data quality if needed.

The EM3002 was coupled with the Applanix POS MV system to account for vessel motion. All dynamic systems were tied into the C-Nav DGNSS precise point differential packet for improved motion and heading calculation.

Table 2-1. Geophysical survey GPS coordinates (NAD83) for the start and end points of each Multibeam survey line.

Trackline Number	Start Latitude	Start Longitude	End Latitude	End Longitude
1	33.43838977	-117.6539082	33.43435529	-117.6460308
2	33.44282379	-117.6631655	33.43415627	-117.6462496
3	33.44261967	-117.6632279	33.43398379	-117.6464371
4	33.44268046	-117.6638936	33.43383785	-117.6465934
5	33.44492779	-117.6688107	33.43348233	-117.6464649
6	33.44478693	-117.6690782	33.43300947	-117.646068
7	33.44486865	-117.6698337	33.43283626	-117.6463971
8	33.4446646	-117.6698833	33.43249458	-117.6461429
9	33.44456725	-117.6700361	33.43236224	-117.6462205
10	33.44436313	-117.6700985	33.43199459	-117.6458874
11	33.44654392	-117.6753735	33.43148118	-117.6456791
12	33.44640296	-117.6756539	33.43123143	-117.6455041
13	33.44627364	-117.675768	33.43104592	-117.6456601
14	33.44620677	-117.6762281	33.43069105	-117.6454057
15	33.44592912	-117.6760084	33.43047941	-117.6455143
16	33.44577701	-117.6763655	33.43037346	-117.6455922
17	33.44553021	-117.6763891	33.42978203	-117.645163
18	33.4453692	-117.6764135	33.42953155	-117.6451297
19	33.44531452	-117.676605	33.42933392	-117.645081
20	33.44505587	-117.6768332	33.42917537	-117.645127
21	33.4448943	-117.6769599	33.42508404	-117.6377967
22	33.44441273	-117.6767643	33.42489895	-117.637874
23	33.44445221	-117.6773915	33.42463366	-117.6381553
24	33.44417287	-117.6774788	33.42453912	-117.6385794
25	33.44391597	-117.6773873	33.42440543	-117.6389245
26	33.44370021	-117.6776159	33.42425975	-117.6390336
27	33.44353899	-117.6776786	33.42411309	-117.6393314
28	33.4434206	-117.6777544	33.42404543	-117.6396613
29	33.44321536	-117.6780215	33.42397882	-117.6397867
30	33.44293616	-117.6780833	33.42392345	-117.6402897
31	33.44274228	-117.6782353	33.42369781	-117.6405555
32	33.44260138	-117.6785029	33.42338185	-117.6404273
33	33.44223597	-117.6786408	33.42309139	-117.6404724
34	33.44205344	-117.6786777	33.42303496	-117.6411799
35	33.44173071	-117.6788543	33.42282357	-117.6412413
36	33.44163335	-117.6790071	33.42280712	-117.6418705
37	33.4413958	-117.6792995	33.42270101	-117.6419798
38	33.44126618	-117.6794648	33.42252659	-117.6425449
39	33.44087981	-117.6795129	33.42231568	-117.6425119

Trackline Number	Start Latitude	Start Longitude	End Latitude	End Longitude
40	33.44069707	-117.6795882	33.42216812	-117.6429828
41	33.44013903	-117.6796479	33.42213938	-117.6434388
42	33.4400186	-117.6800947	33.42179434	-117.6438296
43	33.43975903	-117.6804892	33.42150371	-117.6439061
44	33.43956556	-117.6805645	33.42148545	-117.6448814
45	33.43919027	-117.6805487	33.42130044	-117.6449429
46	33.43899567	-117.6808287	33.42093147	-117.6448615
47	33.43878005	-117.6810317	33.42086281	-117.6453802
48	33.43865016	-117.6812481	33.42072852	-117.6458354
49	33.43837061	-117.6813739	33.42067403	-117.6461654
50	33.43820876	-117.6815517	33.42055391	-117.646432
51	33.4378554	-117.6814466	33.42042003	-117.6468085
52	33.43763851	-117.6818798	33.42002435	-117.6467899

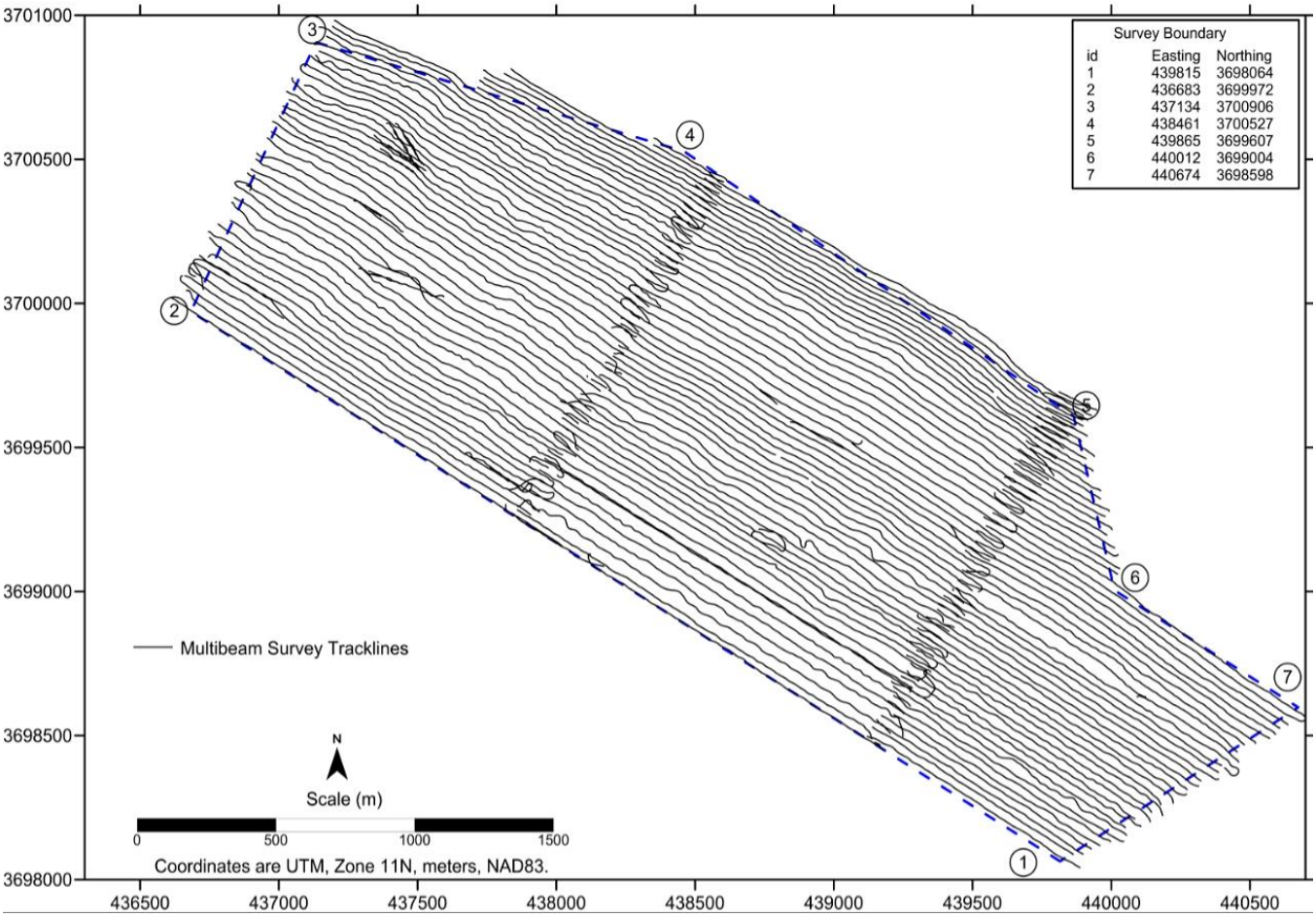

Figure 2.1 Multibeam survey tracklines, and survey boundary coordinates

Table 2-2. Geophysical survey GPS coordinates (NAD83) for the start and end points of each Sub-bottom survey line.

Trackline Number	Start Latitude	Start Longitude	End Latitude	End Longitude
1	33.44435628	-117.6759416	33.44122653	-117.6785389
2	33.44390197	-117.6751027	33.44096307	-117.6781335
3	33.4436407	-117.674294	33.44043476	-117.6775821
4	33.4433799	-117.6733989	33.43997888	-117.6770312
5	33.44309353	-117.6727629	33.43993671	-117.6759074
6	33.44360975	-117.671096	33.43967497	-117.6751851
7	33.44322645	-117.6705168	33.4387825	-117.6749766
8	33.44257687	-117.6700509	33.43856749	-117.6745428
9	33.44219466	-117.6692702	33.43794395	-117.6737314
10	33.44200596	-117.6684333	33.43753793	-117.6728929
11	33.44169558	-117.6677683	33.43730111	-117.6720268
12	33.44143519	-117.6667868	33.43769485	-117.6706759
13	33.44105187	-117.6662077	33.43687451	-117.6705256
14	33.44100976	-117.6650551	33.43632231	-117.6699164
15	33.44060243	-117.664447	33.43610993	-117.668993
16	33.44097517	-117.6624909	33.43652841	-117.6675271
17	33.44080766	-117.6622016	33.4356113	-117.6674048
18	33.44074182	-117.6609623	33.43518062	-117.6666526
19	33.44040616	-117.6604989	33.43484637	-117.6659299
20	33.44004927	-117.6594879	33.43446367	-117.6652356
21	33.43973837	-117.6589094	33.43408127	-117.6644837
22	33.43940439	-117.6581291	33.43369841	-117.6638183
23	33.43907055	-117.6573199	33.43333969	-117.663153
24	33.43842047	-117.6569405	33.43302927	-117.6624881
25	33.43810987	-117.6563044	33.43267055	-117.6618229
26	33.43765511	-117.6555232	33.43221552	-117.6610993
27	33.43727235	-117.654829	33.4318811	-117.6604055
28	33.43703525	-117.6539918	33.43111088	-117.65991
29	33.43665293	-117.6532112	33.4310181	-117.6591891
30	33.43631816	-117.6525749	33.43049015	-117.6585514
31	33.43552209	-117.6523961	33.43018031	-117.6577714
32	33.43555215	-117.6512729	33.42970096	-117.6570765
33	33.43524182	-117.6505792	33.42953603	-117.6562975
34	33.43485963	-117.6497698	33.42910451	-117.6556894
35	33.43457285	-117.6491916	33.42845502	-117.6551948
36	33.4342637	-117.6482675	33.4279986	-117.6547305
37	33.43380709	-117.647832	33.42771334	-117.6538643
38	33.43272151	-117.6475935	33.42730566	-117.653314
39	33.43245781	-117.6472171	33.4269964	-117.6524188

Trackline Number	Start Latitude	Start Longitude	End Latitude	End Longitude
40	33.43069299	-117.6475496	33.42656486	-117.6518107
41	33.43033358	-117.6469997	33.42623038	-117.6511169
42	33.42966021	-117.6464474	33.42574994	-117.6506236
43	33.4293488	-117.6459554	33.4254648	-117.6497286
44	33.42855452	-117.6454311	33.42493725	-117.6490046
45	33.42821941	-117.6448525	33.42465091	-117.64834
46	33.42783733	-117.6440144	33.4241949	-117.6477894
47	33.42752651	-117.6434072	33.42388485	-117.6470382
48	33.42699907	-117.6426544	33.42345283	-117.6465166
49	33.42663994	-117.6420469	33.42311937	-117.6456213
50	33.4261119	-117.6414094	33.42266365	-117.645013
51	33.42577676	-117.6408308	33.42235358	-117.6442619
52	33.42522471	-117.6401643	33.42201697	-117.6439714
53	33.44096809	-117.663816	33.4322871	-117.6475327
54	33.4455646	-117.675807	33.43049993	-117.6475194
55	33.44401488	-117.676544	33.42502958	-117.6405373
56	33.44268108	-117.6775419	33.42352805	-117.6413328
57	33.44163615	-117.6787149	33.42257827	-117.6428523

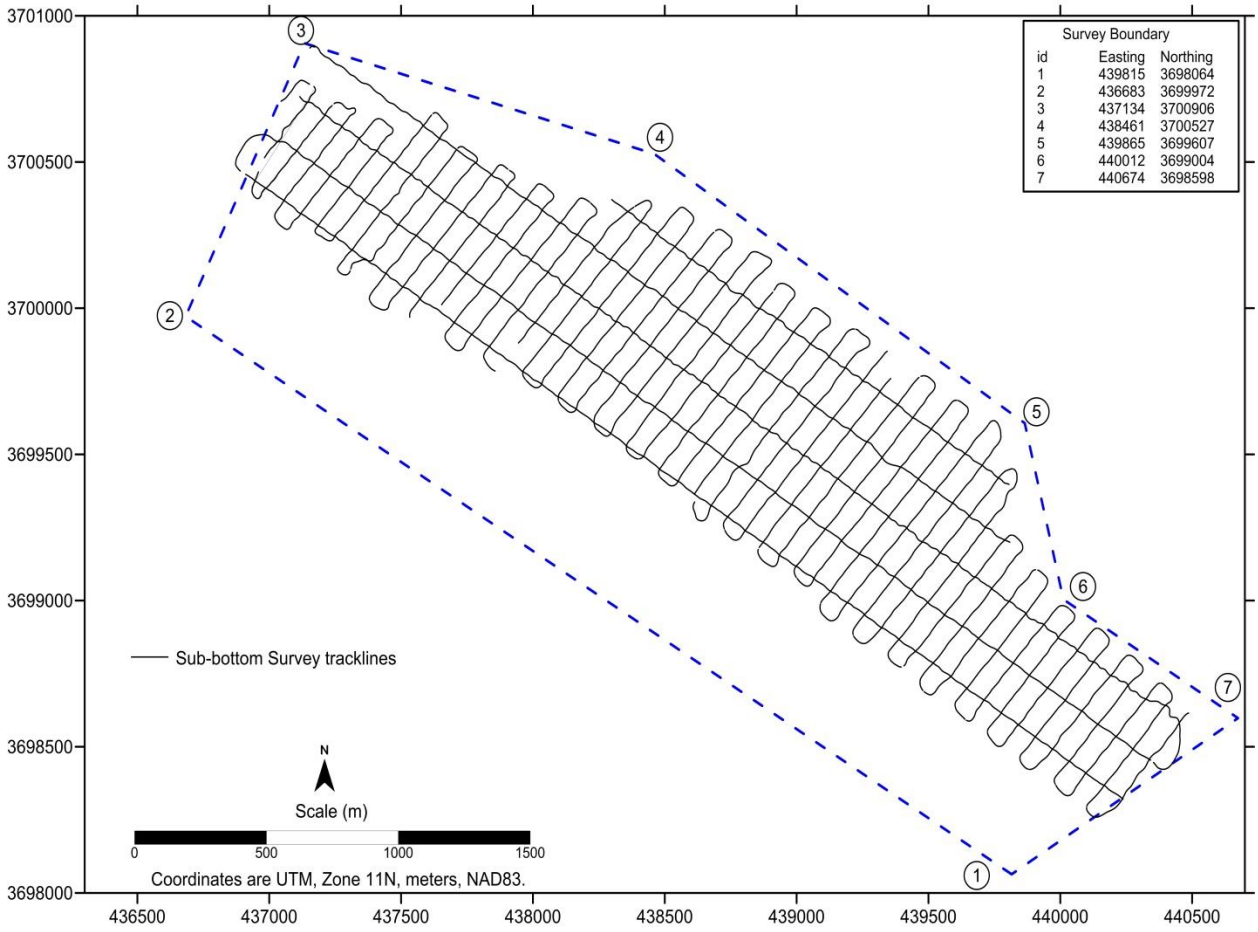

Figure 2-2. Location map for sub-bottom tracklines and survey boundary coordinates

2.4 DATA PROCESSING

2.4.1 Bathymetry

Multibeam bathymetry was processed using CARIS Hydrographic Information Processing System (HIPS) version 9.0.21. Verified tide data from the NOAA Los Angeles tide gauge were applied to the data set to reduce to the MLLW datum.

Bathymetry data was corrected for dynamic vessel heave, pitch and roll. The data was also examined for any gaps or outliers in attitude and heading. After all individual lines had been examined the data was merged and gridded.

Swath and area-based editing techniques were employed to remove acoustic noise and data outliers. Gridded data was examined for vertical discrepancies needing localized editing. After the data were corrected and cleaned, a 50 cm resolution gridded dataset, or DTM, was exported as both a GeoTIF and an ASCII xyz file to ArcGIS 10.1 for digitization.

3.0 MULTIBEAM SONAR SURVEY RESULTS

The objective of the survey was to provide data to assess the suitability and locations for the expansion of the WNR restoration reef site. The transect lines provided continuous bathymetric coverage within area of the intake and discharge systems.

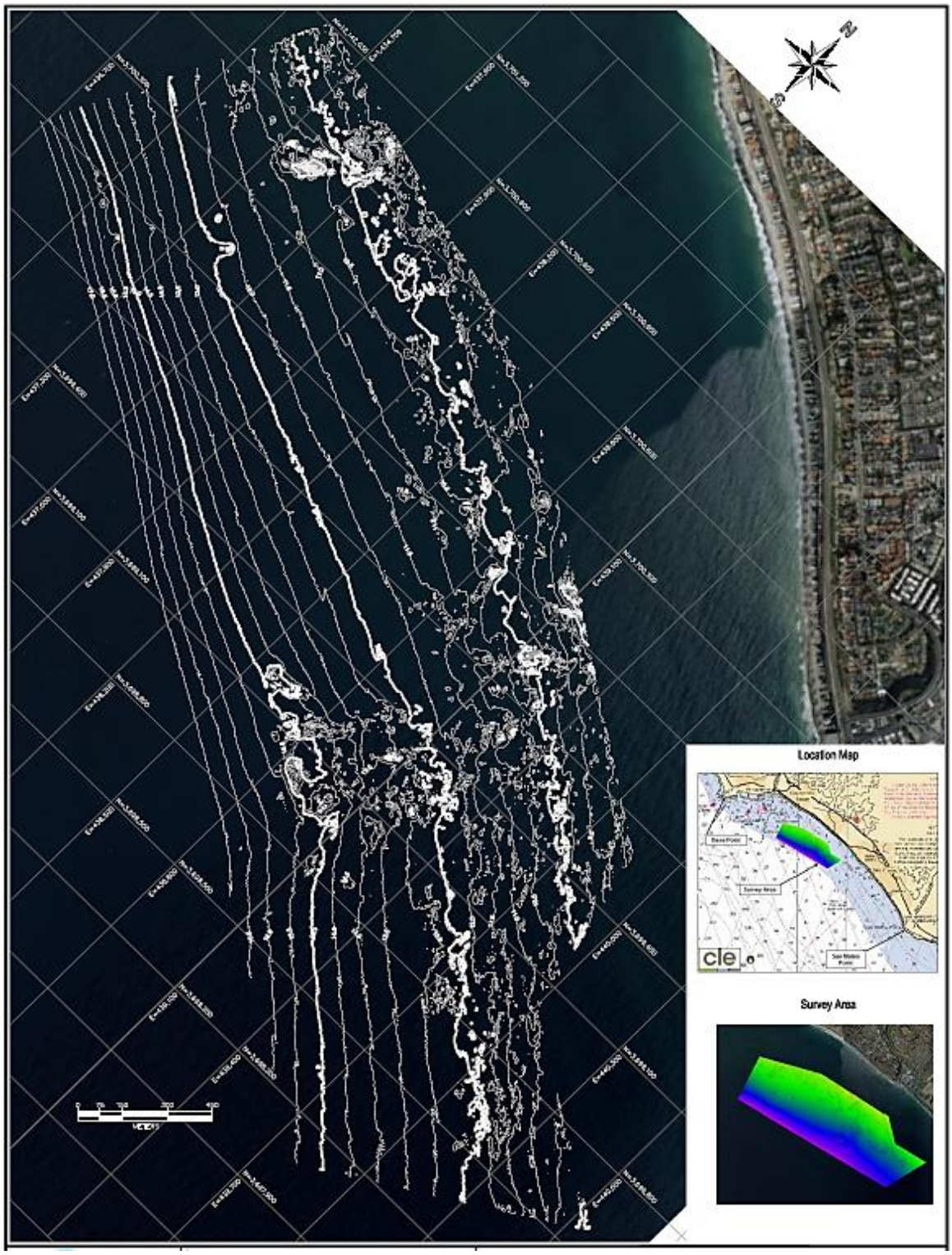

Figure 3-1. Multibeam bathymetric survey contour map

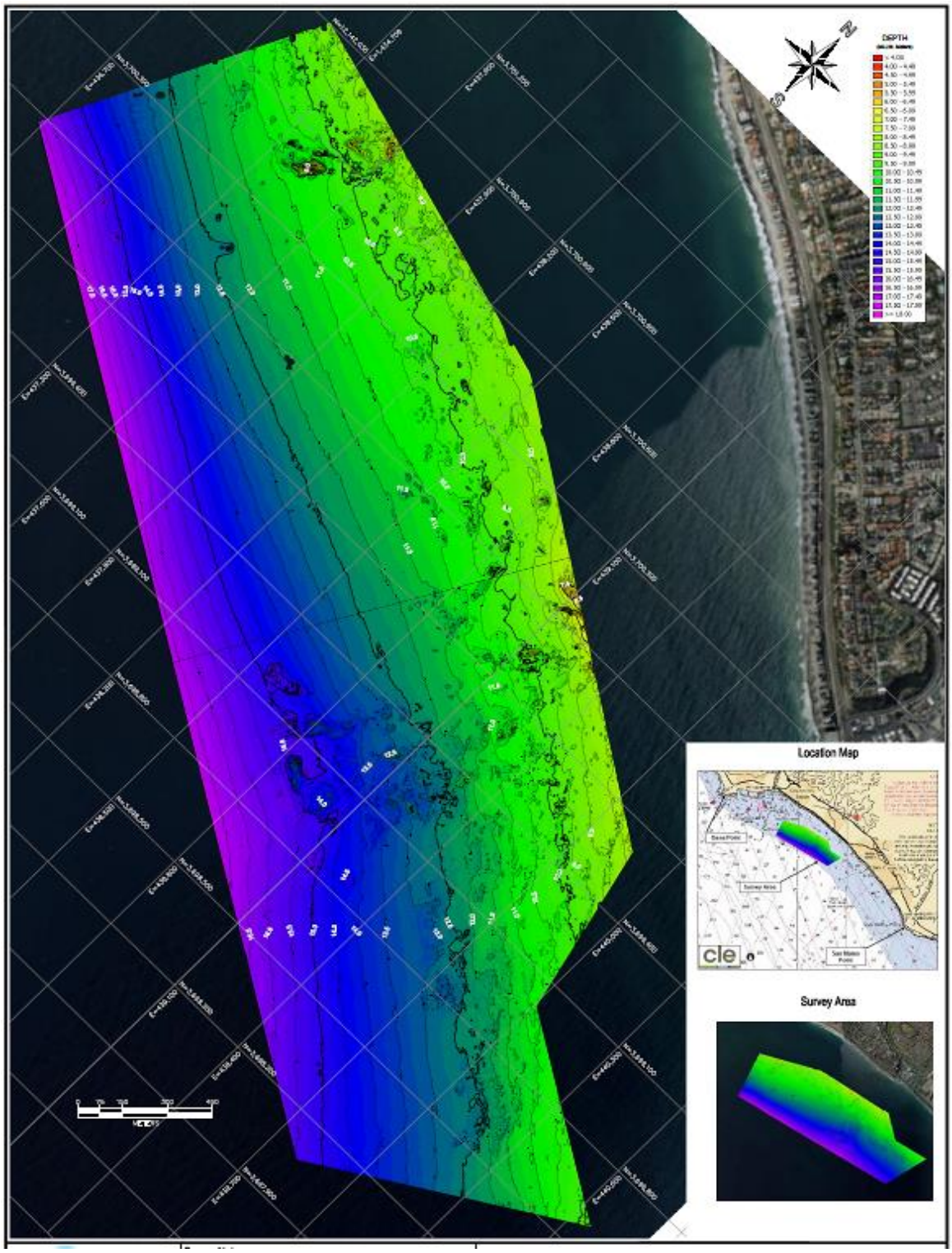

Figure 3.2 Multibeam 20cm bathymetry and ½m contour interval map

4.0 SUB-BOTTOM SURVEY RESULTS

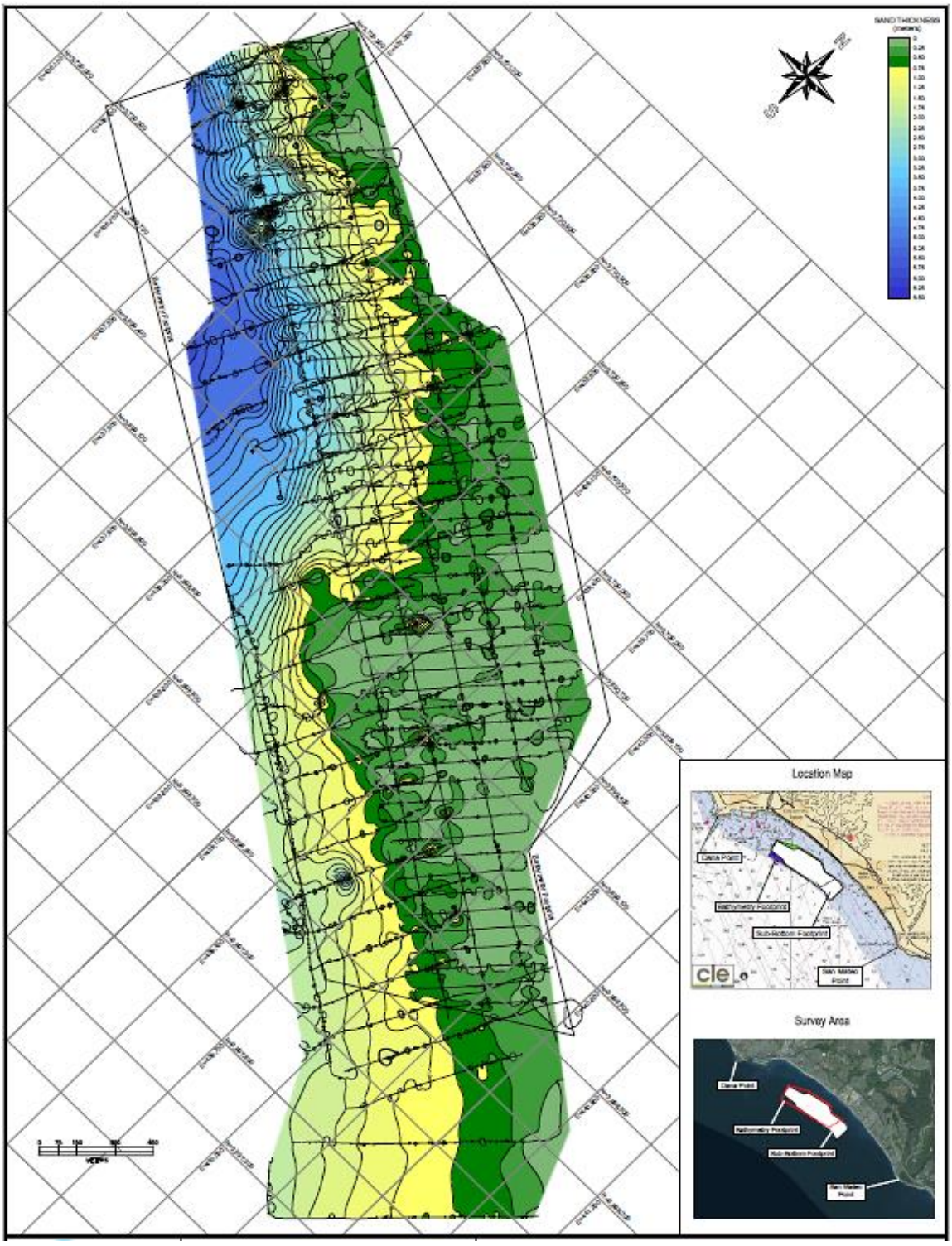

Figure 4-1. Isopach map of unconsolidated sand thickness, 0.25m contour interval, map for sub-bottom data April 2017.

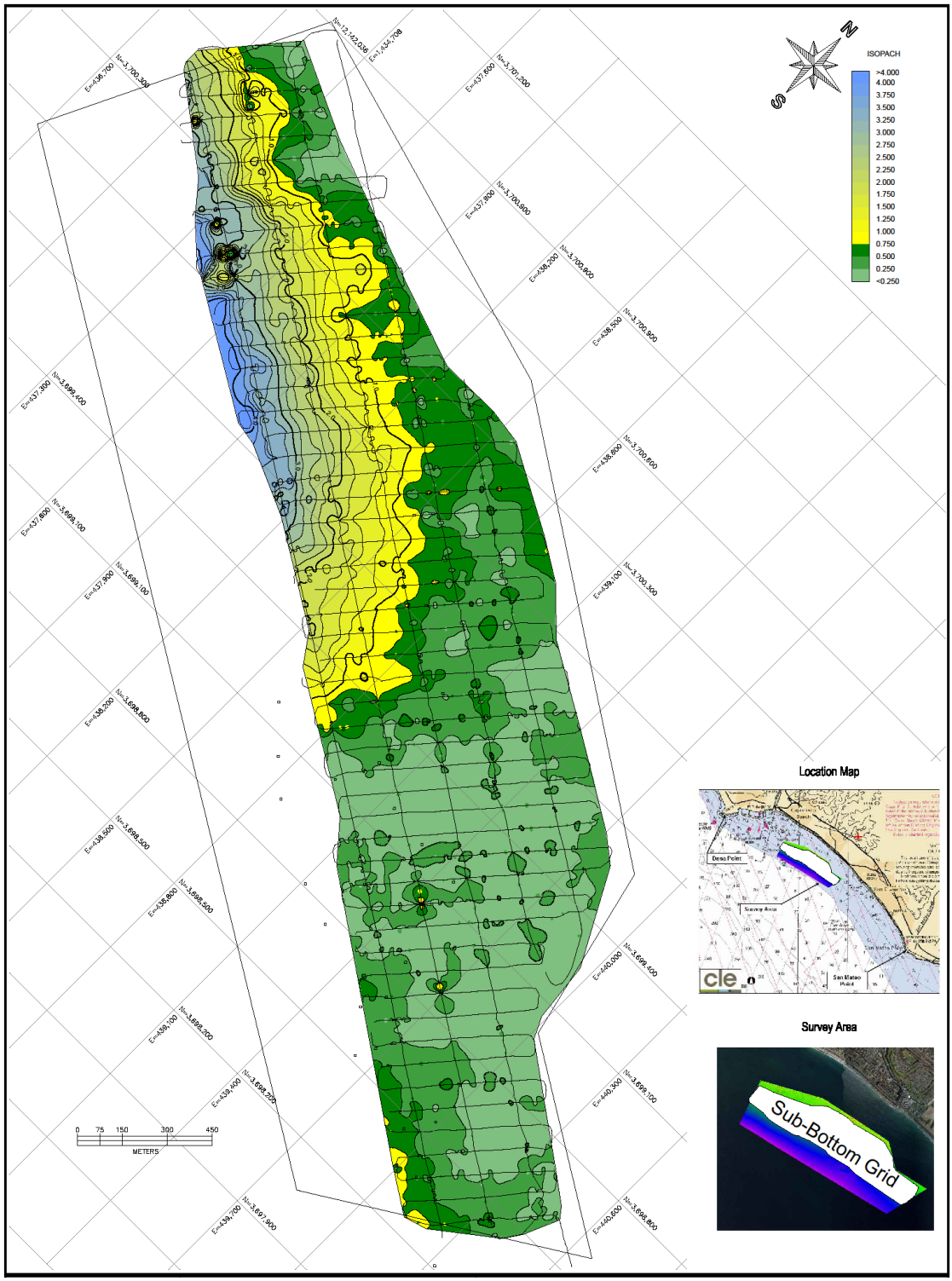

Figure 4.2 Results from the nearshore sub-bottom profiler survey. Isopach map of unconsolidated sand thickness, 0.25m contour interval

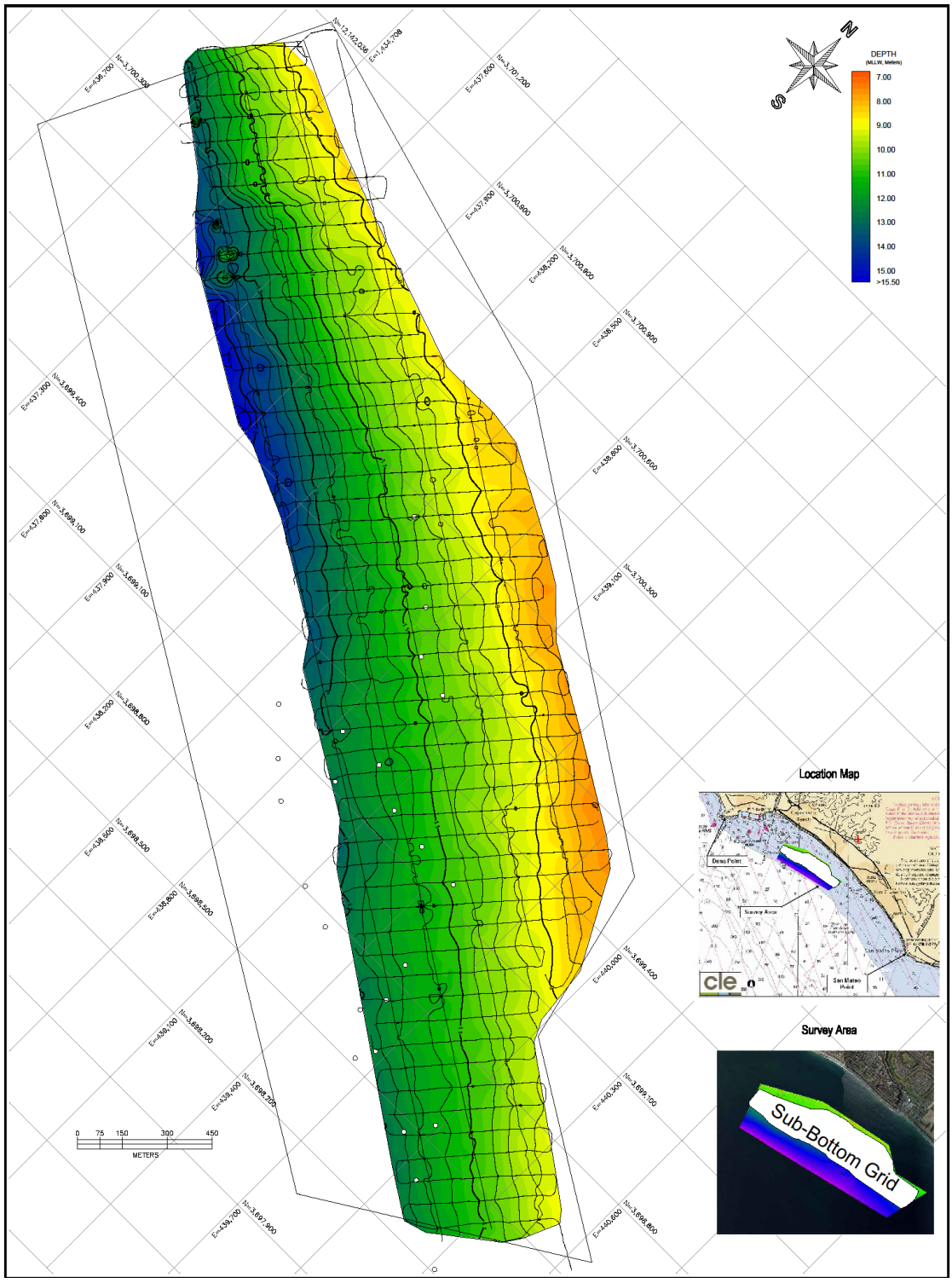

Figure 4.3 Results from the nearshore sub-bottom profiler survey. Depth to sub-sand acoustic horizon, 0.25m contour interval.

APPENDIX A

MARINE MAMMAL OBSERVATION REPORT

MARINE MAMMAL OBSERVATION REPORT

Marine Wildlife Monitoring Report (Sub-bottom Profile Survey)

Vessel: R/V Molly
Marine Wildlife Monitor Observer: Chris Castillo
Date of survey: April 21, 2017

The results of the Marine Wildlife Monitoring report are described below. The study required the use of sound producing instrumentation, requiring the presence of a marine mammal observer (MMO). A pre-watch duration of 5-10 minutes and an exclusion zone, radius from the transducer of 150-m were set as the parameters for operation of the sub-bottom profiler. Any confirmed sightings of cetaceans within those parameters would require a shut-down of sound production. Such delays or shut-downs, in the presence of pinnipeds, were at the enforced by the MMO. Any signs of distress by marine mammals were cause for a shut-down.

Fifty-two transect lines were surveyed along the coastline of Dana Point, including the area south of the mouth of San Juan Creek. Marine mammals most likely to be encountered in the near-shore area were California sea lions (*Zalophus californianus*), Harbor seals (*Phoca vitulina*), Bottlenose dolphin (*Tursiops truncates*), Common dolphin (*Delphinus* spp.), and Gray whales (Eschrichtius robustus). During this time of year, Gray whales on their northward migration are often seen with calves. The duration of the cruise was 7 hours and 45 minutes, during which four sightings occurred, and no sighting occurred within the exclusion zone during operation of the acoustic source.

Daily field log reports are found in Table A-1 details the survey sightings and activity log.

Survey Date: 21 April2017

08:30 Reconnaissance of survey area from shore

Conditions: clear skies; 68° F; wind 0-5 knots from the SW; swell ~1.5' @ 10s; Beaufort 1

09:00 Meeting and mobilization at the loading dock in Dana Point Harbor
09:35 Vessel underway

Conditions: clear skies; 69° F; wind 0-5 knots from the SW; swell ~2' @ 10s; Beaufort 1

09:40 Pre-watch started
09:43 Several harbor seals (*Phoca vitulina*) resting on red buoy while leaving port. No harbor seals were seen entering or exiting the water
10:05 Dolphins (Delphinus spp.) sighted ~200m WSW of the vessel. Harbor seal fin and tail observed while in transit 20 m SW of vessel.
10:26 Ramp-up of CHIRP system not possible, at lowest power setting. 40 minutes since last sighting
11:20 Begin grid line acquisition

Conditions: clear skies; 70° F; wind 0-5 knots from the WSW; swell ~2' @ 9s; Beaufort 1

14:05 3 Dolphins (Delphinus spp.) sighted ~175 m SW of the vessel.
15:30 Conditions: clear skies; 70° F; wind 5-10 knots from the WSW; swell ~3' @ 8s; Beaufort 1
16:30 Return to dock begin demobilization

16:34 Apparently the same pile of harbor seals (*Phoca vitulina*) continue to occupy the red buoy near the entrance to the harbor
18:00 Demobilization complete.

SUMMARY
Over the course of the day, 12 marine mammal sightings were recorded, none of which required shut-downs as mitigation action for compliance with the marine wildlife protection plan.

Table A-1. Marine mammal sightings for 21 April 2017.

Sighting No.	Time (PDT)	Bearing	Species	Dist. From Source (m)	Vessel Activity	Direction of Travel	Number	Behavior
1	09:43	135	Harbor seal (*Phoca vitulina*)	30	Transit, source off	Stationary	4	Resting on buoy
2	10:05	110	Common dolphin (*Delphinus* spp.)	200	Pre-watch, source on	190°	1	Fin and tail out of the water, then disappeared
3	10:05	115	Harbor seal (*Phoca vitulina*)	20	Vessel in transit, source off	180°	1	Fin and tail observed swimming
3	14:05	130	Common dolphin (*Delphinus* spp.)	175	Acquisition, no shutdown	0°	3	Emerged upon shutdown, seemed curious about the source
4	16:43	315	Harbor seal (*Phoca vitulina*)	30	Post-acquisition	Stationary	4	Resting on buoy

Marine Wildlife Monitoring Report (Multibeam Sonar Survey)

Vessel: R/V Molly
Marine Wildlife Monitor Observer: James Culpa
Dates of survey: April 17th-22nd, 2017

The results of the Marine Wildlife Monitoring report are described below. The study required the use of sound producing instrumentation, requiring the presence of a marine mammal observer (MMO). A pre-watch duration of 5-10 minutes and an exclusion zone, radius from the transducer of 150-m were set as the parameters for operation of the multibeam sonar. Any confirmed sightings of cetaceans within those parameters would require a shut-down of sound production. Such delays or shut-downs, in the presence of pinnipeds, were at the enforced by the MMO. Any signs of distress by marine mammals were cause for a shut-down.

Transect lines were surveyed along the coastline of Dana Point, including the area south of the mouth of San Juan Creek. Marine mammals most likely to be encountered in the near-shore area were California sea lions (*Zalophus californianus*), Harbor seals (*Phoca vitulina*), Bottlenose dolphin (*Tursiops truncates*), Common dolphin (*Delphinus* spp.), and Gray whales (Eschrichtius robustus). During this time of year, Gray whales on their northward migration are often seen with calves. No sighting occurred within the exclusion zone during operation of the acoustic source.

The daily field log reports are found in Table A-2.

Survey Date: 17 April 2017

07:30 Reconnaissance of survey area from shore

Conditions: clear skies; 68° F; wind 0-5 knots from the SW; swell ~1.5' @ 10s; Beaufort 1

08:00 Meeting and mobilization at the loading dock in Dana Point Harbor
08:35 Vessel underway
08:40 Pre-watch started
11:03 Several common dolphin (*Delphinus* spp.) observed swimming about 100m SW of the vessel
13:36 1 Gray whale (*Eschrichtius robustus*) swimming 300m NNW of the vessel.
15:40 3 common dolphin (*Delphinus* spp.) observed swimming about 100m NNW of the vessel
18:00 Demobilization complete.

Survey Date: 18 April 2017

07:30 Reconnaissance of survey area from shore

Conditions: clear skies; 68° F; wind 0-5 knots from the SW; swell ~1.5' @ 10s; Beaufort 1

08:00 Meeting and mobilization at the loading dock in Dana Point Harbor
09:01 Harbor seal (*Phoca vitulina*) 100m from the survey vessel, appeared to be observing the survey vessel.
15:09 Harbor seal (*Phoca vitulina*) swimming about 500m from the survey vessel
18:00 Demobilization complete.

Survey Date: 19 April 2017

07:30 Reconnaissance of survey area from shore

Conditions: clear skies; 68° F; wind 0-5 knots from the SW; swell ~1.5' @ 10s; Beaufort 1

08:00 Meeting and mobilization at the loading dock in Dana Point Harbor
08:35 Vessel underway
12:02 Vessel idling, 3-6 Common dolphin (*Delphinus* spp.) observed swimming about 100m from the vessel
16:42 Between 3-6 Common dolphin (*Delphinus* spp.) observed swimming 750m from the survey vessel.
18:00 Demobilization complete.

Survey Date: 20 April 2017

07:30 Reconnaissance of survey area from shore

Conditions: clear skies; 68° F; wind 0-5 knots from the SW; swell ~1.5' @ 10s; Beaufort 1

08:00 Meeting and mobilization at the loading dock in Dana Point Harbor
08:35 Vessel underway
11:30 Vessel idling, 1-2 Gray Whales observed swimming about 100m from the survey vessel
18:00 Demobilization complete.

Survey Date: 21 April 2017

07:30 Reconnaissance of survey area from shore

Conditions: clear skies; 68° F; wind 0-5 knots from the SW; swell ~1.5' @ 10s; Beaufort 1
08:00 Meeting and mobilization at the loading dock in Dana Point Harbor
08:35 Vessel underway
18:00 Demobilization complete. No marine mammals were observed during this survey period.

Survey Date: 22 April 2017

07:30 Reconnaissance of survey area from shore

Conditions: clear skies; 68° F; wind 0-5 knots from the SW; swell ~1.5' @ 10s; Beaufort 1

08:00 Meeting and mobilization at the loading dock in Dana Point Harbor
08:35 Vessel underway
14:48 3-6 Common dolphin (*Delphinus* spp.) observed feeding about 50m from the vessel
18:00 Demobilization complete.

SUMMARY

Over the course of 5 days, around 25 marine mammal sightings were recorded, none of which required shut-downs as mitigation action for compliance with the marine wildlife protection plan.

Table A-2. Marine mammal sightings for April 17-22nd 2017.

Sighting No.	Time (PDT)	Bearing	Species	Dist. From Source (m)	Vessel Activity	Direction of Travel	Number	Behavior
April 17th, 2017								
1	11:03	220	Common dolphin (*Delphinus* spp.)	100	Idle	SW	3-7	Swimming
2	13:36	200	Gray Whale (*Eschrichtius robustus*)	300	Surveying, ~3 knots	NNW	1	Swimming, breached
3	15:40	283	Common dolphin (*Delphinus* spp.)	100	Surveying, ~3 knots	NNW	3	Swimming
April 18th, 2017								
4	09:01	123	Harbor seal (*Phoca vitulina*)	100	Idle	SW	1	Swimming, observing vessel
5	15:09	166	Harbor seal (*Phoca vitulina*)	500+	Surveying, 3-5 knots	NW	1	Swimming, observing vessel
April 19th, 2017								
6	12:02	200	Common dolphin (*Delphinus* spp.)	100	Idle	NNW	3-6	Swimming
7	16:42	168	Common dolphin (*Delphinus* spp.)	750	Surveying, ~3 knots	W	3-6	Swimming
April 20th, 2017								
8	11:30	268	Gray Whale (*Eschrichtius robustus*)	100	Idle	NNW	1-2	Swimming
April 22nd, 2017								
9	14:48	179	Common dolphin (*Delphinus* spp.)	50	Idle	W	3-6	Feeding

**No sightings were reported on April 21st

APPENDIX B

EXHIBIT H

EXHIBIT H

Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
Air Quality and Greenhouse Gas (GHG) Emissions (MND Section 3.3.3)						
MM AIR-1: Engine Tuning, Engine Certification, and Fuels. The following measures will be required to be implemented by all Permittees under the Offshore Geophysical Permit Program (OGPP), as applicable depending on the county offshore which a survey is being conducted. Pursuant to section 93118.5 of CARB's Airborne Toxic Control Measures, the Tier 2 engine requirement applies only to diesel-fueled vessels.	All Counties: Maintain all construction equipment in proper tune according to manufacturers' specifications; fuel all off-road and portable diesel-powered equipment with California Air Resources Board (CARB)-certified motor vehicle diesel fuel limiting sulfur content to 15 parts per million or less (CARB Diesel).	Daily emissions of criteria pollutants during survey activities are minimized.	Determine engine certification of vessel engines. Review engine emissions data to assess compliance, determine if changes in tuning or fuel are required.	OGPP permit holder and contract vessel operator; California State Lands Commission (CSLC) review of Final Monitoring Report.	Prior to, during, and after survey activities. Submit Final Monitoring Report after completion of survey activities.	N/A- exempt-gasoline vessel
	Los Angeles and Orange Counties: Use vessel engines meeting CARB's Tier 2-certified engines or cleaner; the survey shall be operated such that daily NOx emissions do not exceed 100 pounds based on engine certification emission factors. This can be accomplished with Tier 2 engines if daily fuel use is 585 gallons or less, and with Tier 3 engines if daily fuel use is 935 gallons or less		Verify that Tier 2 or cleaner engines are being used. Calculate daily NOx emissions to verify compliance with limitations.			N/A- exempt-gasoline vessel
	San Luis Obispo County: Use vessel engines meeting CARB's Tier 2-certified engines or cleaner, accomplished with Tier 2 engines if daily fuel use is 585 gallons or less; all diesel equipment shall not idle for more than 5 minutes; engine use needed to maintain position in the water is not considered idling; diesel idling within 300 meters (1,000 feet) of sensitive receptors is not permitted; use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Verify that Tier 2 or cleaner engines are being used. Inform vessel operator(s) of idling limitation. Investigate availability of alternative fuels			N/A- exempt-gasoline vessel
	Santa Barbara County: Use vessel engines meeting CARB's Tier 2-certified engines or cleaner, accomplished with Tier 2 engines if daily fuel use is 790 gallons or less.		Verify that Tier 2 or cleaner engines are being used. Investigate availability of alternative fuels			N/A- exempt-gasoline vessel
	Ventura County: Use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Investigate availability of alternative fuels.			N/A- exempt-gasoline vessel

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
MM BIO-1: Marine Mammal and Sea Turtle Presence – Current Information.	All State waters; prior to commencement of survey operations, the geophysical operator shall: (1) contact the National Oceanic and Atmospheric Administration Long Beach office staff and local whale-watching operations and shall acquire information on the current composition and relative abundance of marine wildlife offshore, and (2) convey sightings data to the vessel operator and crew, survey party chief, and onboard Marine Wildlife Monitors (MWMs) prior to departure. This information will aid the MWMs by providing data on the approximate number and types of organisms that may be in the area.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Document contact with appropriate sources. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder; Inquiry to NOAA and local whale watching operators.	Prior to Survey	EC 3/4/17
MM BIO-2: Marine Wildlife Monitors (MWMs).	Except as provided in section 7(h) of the General Permit, a minimum of two (2) qualified MWMs who are experienced in marine wildlife observations shall be onboard the survey vessel throughout both transit and data collection activities. The specific monitoring, observation, and data collection responsibilities shall be identified in the Marine Wildlife Contingency Plan required as part of all Offshore Geophysical Permit Program permits. Qualifications of proposed MWMs shall be submitted to the National Oceanic and Atmospheric Administration (NOAA) and CSLC at least twenty-one (21) days in advance of the survey for their approval by the agencies. Survey operations shall not commence until the CSLC approves the MWMs.	Competent and professional monitoring or marine mammals and sea turtles; compliance with established monitoring policies.	Document contact with and approval by appropriate agencies. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	EC 3/4/17
MM BIO-3: Safety Zone Monitoring.	Onboard Marine Wildlife Monitors (MWMs) responsible for observations during vessel transit shall be responsible for monitoring during the survey equipment operations. All visual monitoring shall occur from the highest practical vantage point aboard the survey vessel; binoculars shall be used to observe the surrounding area, as appropriate. The MWMs will survey an area (i.e., safety or exclusion zone) based on the equipment used, centered on the sound source (i.e., vessel, towfish), throughout time that the survey equipment is operating. Safety zone radial distances, by equipment type, include:	No adverse effects to marine mammals or sea turtles due to survey activities are observed; compliance with established safety zones.	Compliance with permit requirements (observers); compliance with established safety zones. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	EC 3/4/17

<table>
<tr><th>Mitigation Measure (MM)</th><th>Location and Scope of Mitigation</th><th>Effectiveness Criteria</th><th>Monitoring or Reporting Action</th><th>Responsible Party</th><th>Timing</th><th>Implementation Date(s) and Initials</th></tr>
<tr><td></td><td>
<table>
<tr><th>Equipment Type Safety Zone (radius, m)</th><th>Equipment Type Safety Zone (radius, m)</th></tr>
<tr><td>Single Beam Echosounder</td><td>50</td></tr>
<tr><td>Multibeam Echosounder</td><td>500</td></tr>
<tr><td>Side-Scan Sonar</td><td>600</td></tr>
<tr><td>Subbottom Profiler</td><td>100</td></tr>
<tr><td>Boomer System</td><td>100</td></tr>
</table>

If the geophysical survey equipment is operated at or above a frequency of 200 kilohertz (kHz), safety zone monitoring and enforcement is not required; however, if geophysical survey equipment operated at a frequency at or above 200 kHz is used simultaneously with geophysical survey equipment less than 200 kHz, then the safety zone for the equipment less than 200 kHz must be monitored. The onboard MWMs shall have authority to stop operations if a mammal or turtle is observed within the specified safety zone and may be negatively affected by survey activities. The MWMs shall also have authority to recommend continuation (or cessation) of operations during periods of limited visibility (i.e., fog, rain) based on the observed abundance of marine wildlife. Periodic reevaluation of weather conditions and reassessment of the continuation/cessation recommendation shall be completed by the onboard MWMs. During operations, if an animal's actions are observed to be irregular, the monitor shall have authority to recommend that equipment be shut down until the animal moves further away from the sound source. If irregular behavior is observed, the equipment shall be shut-off and will be restarted and ramped-up to full power, as applicable, or will not be started until the animal(s) is/are outside of the safety zone or have not been observed for 15 minutes. For nearshore survey operations utilizing vessels that lack the personnel capacity to hold two (2)</td><td></td><td></td><td></td><td></td></tr>
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Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
	MWMs aboard during survey operations, at least twenty-one (21) days prior to the commencement of survey activities, the Permittee may petition the CSLC to conduct survey operations with one (1) MWM aboard. The CSLC will consider such authorization on a case-by-case basis and factors the CSLC will consider will include the timing, type, and location of the survey, the size of the vessel, and the availability of alternate vessels for conducting the proposed survey. CSLC authorizations under this subsection will be limited to individual surveys and under any such authorization; the Permittee shall update the MWCP to reflect how survey operations will occur under the authorization.					
MM BIO-4: Limits on Nighttime OGPP Surveys.	All State waters; nighttime survey operations are prohibited under the OGPP, except as provided below. The CSLC will consider the use of single beam echosounders and passive equipment types at night on a case-by-case basis, taking into consideration the equipment specifications, location, timing, and duration of survey activity.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Presurvey request for nighttime operations, including equipment specifications and proposed use schedule. Document equipment use. Submit Final Monitoring Report after completion of survey activities	OGPP permit holder.	Approval required before survey is initiated. Monitoring Report following completion of survey.	EC 3/4/17

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
MM BIO-5: Soft Start.	All State waters; the survey operator shall use a "soft start" technique at the beginning of survey activities each day (or following a shut down) to allow any marine mammal that may be in the immediate area to leave before the sound sources reach full energy. Surveys shall not commence at nighttime or when the safety zone cannot be effectively monitored. Operators shall initiate each piece of equipment at the lowest practical sound level, increasing output in such a manner as to increase in steps not exceeding approximately 6 decibels (dB) per 5- minute period. During ramp-up, the Marine Wildlife Monitors (MWMs) shall monitor the safety zone. If marine mammals are sighted within or about to enter the safety zone, a power-down or shut down shall be implemented as though the equipment was operating at full power. Initiation of ramp-up procedures from shut down requires that the MWMs be able to visually observe the full safety zone.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Compliance with permit requirements (observers); compliance with safe start procedures. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Immediately prior to survey.	RS 3/16/17
MM BIO-6: Practical Limitations on Equipment Use and Adherence to Equipment Manufacturer's Routine Maintenance Schedule.	All State waters; geophysical operators shall follow, to the maximum extent possible, the guidelines of Zykov (2013) as they pertain to the use of subbottom profilers and sidescan sonar, including: • Using the highest frequency band possible for the subbottom profiler; • Using the shortest possible pulse length; and • Lowering the pulse rate (pings per second) as much as feasible. Geophysical operators shall consider the potential applicability of these measures to other equipment types (e.g., boomer). Permit holders will conduct routine inspection and maintenance of acoustic-generating equipment to ensure that low energy geophysical equipment used during permitted survey activities remains in proper working order and within manufacturer's equipment specifications. Verification of the date and occurrence of such	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Document initial and during survey equipment settings. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Immediately prior to and during survey.	RS 3/16/17

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
	equipment inspection and maintenance shall be provided in the required presurvey notification to CSLC.					
MM BIO-7: Avoidance of Pinniped Haul-Out Sites.	The Marine Wildlife Contingency Plan (MWCP) developed and implemented for each survey shall include identification of haul-out sites within or immediately adjacent to the proposed survey area. For surveys within 300 meters (m) of a haul-out site, the MWCP shall further require that: • The survey vessel shall not approach within 91 m of a haul-out site, consistent with National Marine Fisheries Service (NMFS) guidelines; • Survey activity close to haul-out sites shall be conducted in an expedited manner to minimize the potential for disturbance of pinnipeds on land; and • Marine Wildlife Monitors shall monitor pinniped activity onshore as the vessel approaches, observing and reporting on the number of pinnipeds potentially disturbed (e.g., via head lifting, flushing into the water). The purpose of such reporting is to provide CSLC and California Department of Fish and Wildlife (CDFW) with information regarding potential	No adverse effects to pinnipeds at haul outs are observed.	Document pinniped reactions to vessel presence and equipment use. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Monitoring Report following completion of survey	RS 3/18/17
MM BIO-8: Reporting Requirements – Collision.	All State waters; if a collision with marine mammal or reptile occurs, the vessel operator shall document the conditions under which the accident occurred, including the following: • Vessel location (latitude, longitude) when the collision occurred; • Date and time of collision; • Speed and heading of the vessel at the time of collision; • Observation conditions (e.g., wind speed and direction, swell height, visibility in miles or kilometers, and presence of rain or fog) at the time of	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Monitoring Report following completion of survey.	N/A No Collisions Reported 03-21-17 / 04-22-17

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
	collision; • Species of marine wildlife contacted (if known); • Whether an observer was monitoring marine wildlife at the time of collision; and, • Name of vessel, vessel owner/operator, and captain officer in charge of the vessel at time of collision. After a collision, the vessel shall stop, if safe to do so; however, the vessel is not obligated to stand by and may proceed after confirming that it will not further damage the animal by doing so. The vessel will then immediately communicate by radio or telephone all details to the vessel's base of operations, and shall immediately report the incident. Consistent with Marine Mammal Protection Act requirements, the vessel's base of operations or, if an onboard telephone is available, the vessel captain him/herself, will then immediately call the National Oceanic and Atmospheric Administration (NOAA) Stranding Coordinator to report the collision and follow any subsequent instructions. From the report, the Stranding Coordinator will coordinate subsequent action, including enlisting the aid of marine mammal rescue organizations, if appropriate. From the vessel's base of operations, a telephone call will be placed to the Stranding Coordinator, NOAA National Marine Fisheries Service (NMFS), Southwest Region, Long Beach, to obtain instructions. Although NOAA has primary responsibility for marine mammals in both State and Federal waters, the California Department of Fish and Wildlife (CDFW) will also be advised that an incident has occurred in State waters affecting a protected species.					
MM BIO-9: Limitations on Survey Operations	All MPAs; prior to commencing survey activities, geophysical operators shall coordinate with the CLSC, California Department of Fish and Wildlife (CDFW), and	No adverse effects to MPA resources due to survey	Monitor reactions of wildlife to survey operations; report on	OGPP permit holder; survey permitted by	Prior to survey.	N/A No MPAs in project area

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
in Select Marine Protected Areas (MPAs).	any other appropriate permitting agency regarding proposed operations within MPAs. The scope and purpose of each survey proposed within a MPA shall be defined by the permit holder, and the applicability of the survey to the allowable MPA activities shall be delineated by the permit holder. If deemed necessary by CDFW, geophysical operators will pursue a scientific collecting permit, or other appropriate authorization, to secure approval to work within a MPA, and shall provide a copy of such authorization to the CSLC as part of the required presurvey notification to CSLC. CSLC, CDFW, and/or other permitting agencies may impose further restrictions on survey activities as conditions of approval	activities are observed.	shutdown conditions and survey restart. Submit Final Monitoring Report after completion of survey activities.	CDFW.		
MM HAZ-1: Oil Spill Contingency Plan (OSCP) Required Information.	Permittees shall develop and submit to CSLC staff for review and approval an OSCP that addresses accidental releases of petroleum and/or non-petroleum products during survey operations. Permittees' OSCPs shall include the following information for each vessel to be involved with the survey: • Specific steps to be taken in the event of a spill, including notification names, phone numbers, and locations of: (1) nearby emergency medical facilities, and (2) wildlife rescue/response organizations (e.g., Oiled Wildlife Care Network); • Description of crew training and equipment testing procedures; and • Description, quantities, and location of spill response equipment onboard the vessel.	Reduction in the potential for an accidental spill. Proper and timely response and notification of responsible parties in the event of a spill.	Documentation of proper spill training. Notification of responsible parties in the event of a spill.	OGPP permit holder and contract vessel operator.	Prior to survey.	HE 1/8/17
MM HAZ-2: Vessel fueling restrictions.	Vessel fueling shall only occur at an approved docking facility. No cross vessel fueling shall be allowed.	Reduction in the potential for an accidental spill.	Documentation of fueling activities.	Contract vessel operator.	Following survey.	N/A- boat is trailered and fuels on land
MM HAZ-3: OSCP equipment and supplies.	Onboard spill response equipment and supplies shall be sufficient to contain and recover the worst-case scenario spill of petroleum products as outlined in the OSCP.	Proper and timely response in the event of a spill.	Notification to CSLC of onboard spill response equipment/supplies inventory, verify ability to	Contract vessel operator.	Prior to survey.	HE 2/3/17 - supplies confirmed

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
			respond to worst-case spill.			
MM HAZ-1: Oil Spill Contingency Plan (OSCP) Required Information.	Outlined under **Hazards and Hazardous Materials** (above)					HE 2/17/17
MM HAZ-2: Vessel fueling restrictions.	Outlined under **Hazards and Hazardous Materials** (above)					N/A- boat is trailered and fuels on land
MM HAZ-3: OSCP equipment and supplies.	Outlined under **Hazards and Hazardous Materials** (above)					HE 2/8/17
MM BIO-9: Limitations on Survey Operations in Select MPAs.	Outlined under **Biological Resources** (above)					N/A No MPAs
MM REC-1: U.S. Coast Guard (USCG), Harbormaster, and Dive Shop Operator Notification.	All California waters where recreational diving may occur; as a survey permit condition, the CSLC shall require Permittees to provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to divers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, at least twenty-one (21) days in advance of in-water activities, Permittees shall: (1) post such notices in the harbormasters' offices of regional harbors; and (2) notify operators of dive shops in coastal locations adjacent to the proposed offshore survey operations.	No adverse effects to recreational divers from survey operations.	Notify the USCG, local harbormasters, and local dive shops of planned survey activity. Submit Final Monitoring Report after completion of survey activities.	OGPP Permit holder.	Prior to survey.	EC 2/25/17